AIR QUALITY

NANTICOKE 1992

Working together: The Nanticoke Environmental Committee

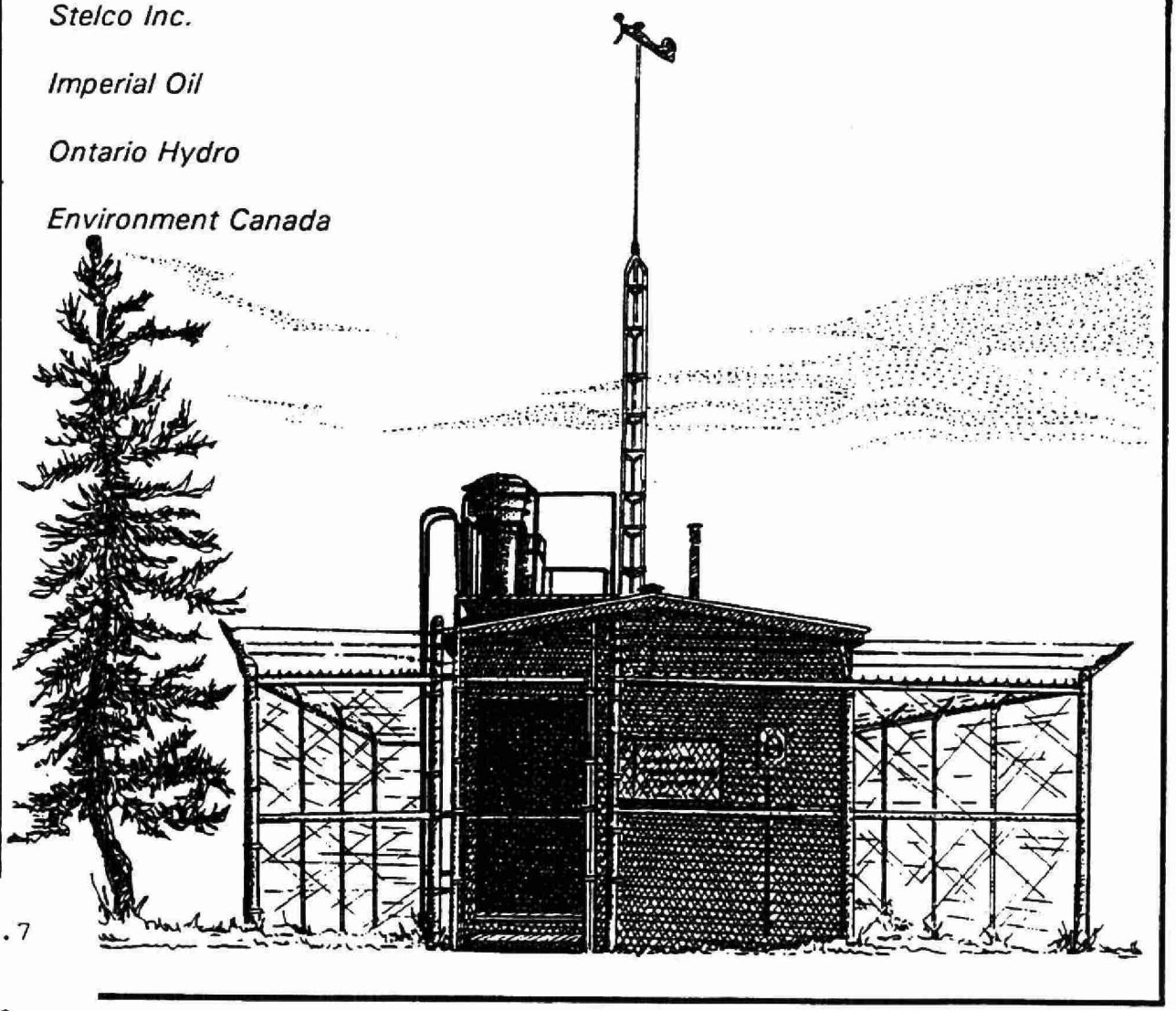
Ontario Ministry of Environment & Energy

Stelco Inc.

Imperial Oil

Ontario Hydro

Environment Canada



ISSN 1192-3644

1992 AIR QUALITY DATA SUMMARY

CITY OF NANTICOKE

NOVEMBER 1993

Cette publication technique
n'est disponible qu'en anglais.

PIBS 2756

1992 AIR QUALITY DATA SUMMARY

CITY OF NANTICOKE

Report prepared by:

F. Dobroff
Air Quality Assessment
West Central Region
Ontario Ministry of Environment and Energy

In cooperation with:

Stelco Inc.
Imperial Oil
Ontario Hydro, and
Environment Canada

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES

LIST OF TABLES

SUMMARY

Air monitoring in the industrial area of the City of Nanticoke showed that air quality was generally very good to excellent. Pollutants such as sulphur dioxide, nitrogen oxides, particulates and fluoride showed very low concentrations well below Ministry objectives. Two types of pollutants were measured at higher levels. These were:

1/ Sulphur odours near Stelco Steel in Nanticoke Village. These were the result primarily of slag quenching operations and coke oven related operations at Stelco. However, this situation is improving. Much lower levels were apparent in the 1992 results, particularly after the company completed operational changes at the blast furnace slag pits in the spring.

2/ Ground level ozone concentrations arising from long range transport of precursor pollutants from the United States during the summer. These levels occur across Southern Ontario. Ozone is damaging both to agricultural crops and human health. To solve this problem, control programs are being implemented in both the U.S. and Canada to reduce industrial and automotive emissions. The programs have set a target year of 2005 by which time the ozone guidelines should be met.

The other two major industries in the area, Imperial Oil and Ontario Hydro's Nanticoke Generating Station showed mostly negligible ground level effects. Imperial Oil's only effect appeared to be infrequent sulphur odour emissions, while Ontario Hydro's main emission - sulphur dioxide, met all objectives out of over 80,000 hours of monitoring.

INTRODUCTION

The Nanticoke Environmental Management Program (NEMP) was formed in 1978 to co-ordinate a study of the background air quality and subsequent impact of industrial development on air quality in the area surrounding Nanticoke. NEMP was sponsored jointly by the Federal and Ontario Governments, Ontario Hydro, Stelco and Texaco (now Imperial Oil). Beginning in 1984, the West Central Region of the Ontario Ministry of Environment and Energy assumed responsibility for network operations from the Air Resources Branch. At that time, the monitoring network was reduced because air quality was generally good, and intensive monitoring in outlying areas was not warranted.

In mid - 1985, NEMP and a similar group concerned with water quality were amalgamated into one organization called the Nanticoke Environmental Committee. All activities are now undertaken under NEC. A private contractor funded by Imperial Oil and Stelco provided one technician to assist in maintaining the air monitoring network.

The purpose of the monitoring program is to determine compliance with provincial air quality criteria and also to measure the impact of the industrial development on the local air quality. Contaminants which may enter the area from outside sources are also identified.

The three main industries which have located in Nanticoke are Ontario Hydro's Thermal Generating Station, Imperial Oil's oil refinery and Stelco's basic steel plant. In addition, several smaller industries have located in the Stelco Industrial Park, north of Stelco.

NEC has undertaken to measure the ambient air concentrations of those compounds or substances that are regulated under the Provincial and Federal Environmental Protection Acts, and that could be a result of the Nanticoke industrial activities. The air quality criteria are set for the protection of human health and well being as well as to protect vegetation, animal life and property.

MONITORING NETWORK

Monitoring stations have been located to take into account predominant wind patterns and source locations as well as to try to differentiate between industrial and other contributions.

A map of the 1992 network is shown in Figure 1a with a closeup in Figure 1b, and the pollutants measured at each location are given in Table 1. Wind data (speed and direction) were measured at Long Point, near Jarvis and in Nanticoke Village. Figure 2 displays the wind frequency distribution measured at Jarvis. Winds from the west, southwest, and northeast sectors tend to predominate. The Jarvis station's wind data were utilized in a computer program known as a "pollution rose" which is essentially a cross tabulation of average hourly pollutant concentrations with wind direction. The pollution roses for individual stations are illustrated graphically on maps in the report. For each "rose" presented, the length of individual lines drawn is proportional to the average concentration when the wind was blowing from that direction. This means that the longest lines tend to point to the pollution source.

In addition to the NEC monitoring network, Ontario Hydro has operated its own network of sulphur dioxide analyzers since 1970. These data are also referred to in this report.

Some of the monitoring equipment in the network has also been provided by Environment Canada under the National Air Pollution Surveillance (NAPS) program. The instruments are operated and maintained by NEC and data is forwarded to Environment Canada.

TABLE 1
MONITORING NETWORK

Map Ref.	Number	Location	SO_2	TSP	COH	TRS	O_3	NOx	DF	F	Wind/ Temp
1	22057	Nanticoke Creek								X	
2	22070	Nanticoke Village							X		
3	22071	Simcoe	X				X	X			
4	22074	Imperial Oil								X	
5	22086	Cheapside	X					X			
6	22092	Rainham/ Sandusk		X					X		
7	22093	N.G.S. Flyash Area							X		
8	22094	Townsend	X								
9	22901	Long Point	X				X	X			X

SO_2 - sulphur dioxide
TSP - total suspended particulates
COH - soiling index
TRS - total reduced sulphur
O_3 - ozone
NOx - oxides of nitrogen
DF - dustfall
F - fluoride

TABLE 1 (Continued)
MONITORING NETWORK

Map Ref.	Number	Location	SO_2	TSP	COH	TRS	O_3	NOx	DF	F	Wind/ Temp
10	22904	S. Walpole School	X(O.H)	X		X					
11	22907	Nanticoke Village	X	X	X	X					
12	22961	Nanticoke North		X						X	
13	22964	Stelco North		X							
14	22883	Jarvis Met Tower									X
15	22911	Balmoral	X(O.H)								
16	22913	Nanticoke Road	X(O.H)								
17	22914	Sandusk	X(O.H)								
18	22915	Kohler	X(O.H)								

SO_2 - sulphur dioxide
TSP - total suspended particulates
COH - soiling index
TRS - total reduced sulphur
O_3 - ozone
NOx - oxides of nitrogen
DF - dustfall
F - fluoride
O.H - Ontario Hydro monitor (SO_2)

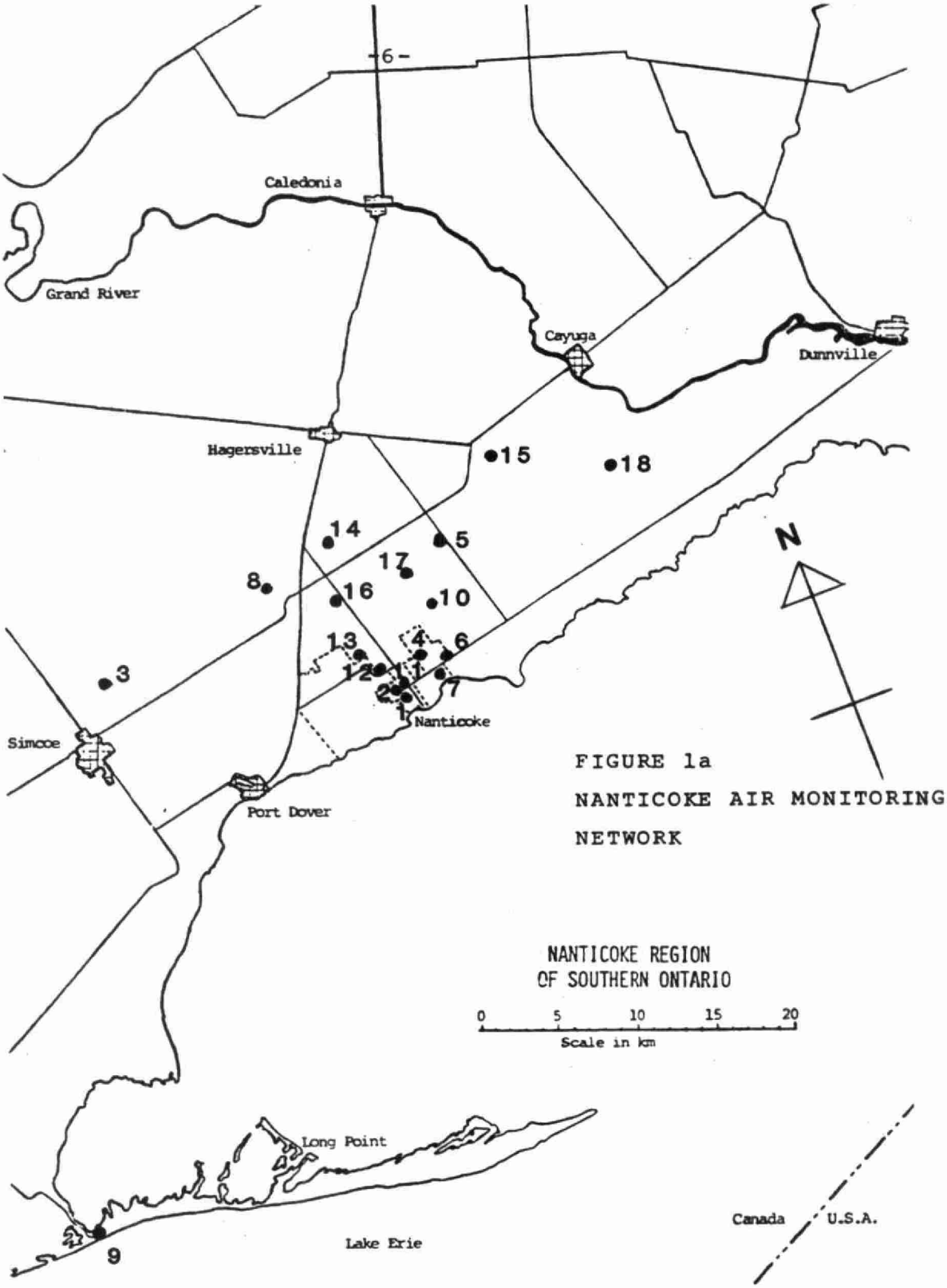


FIGURE 1a
NANTICOKE AIR MONITORING
NETWORK

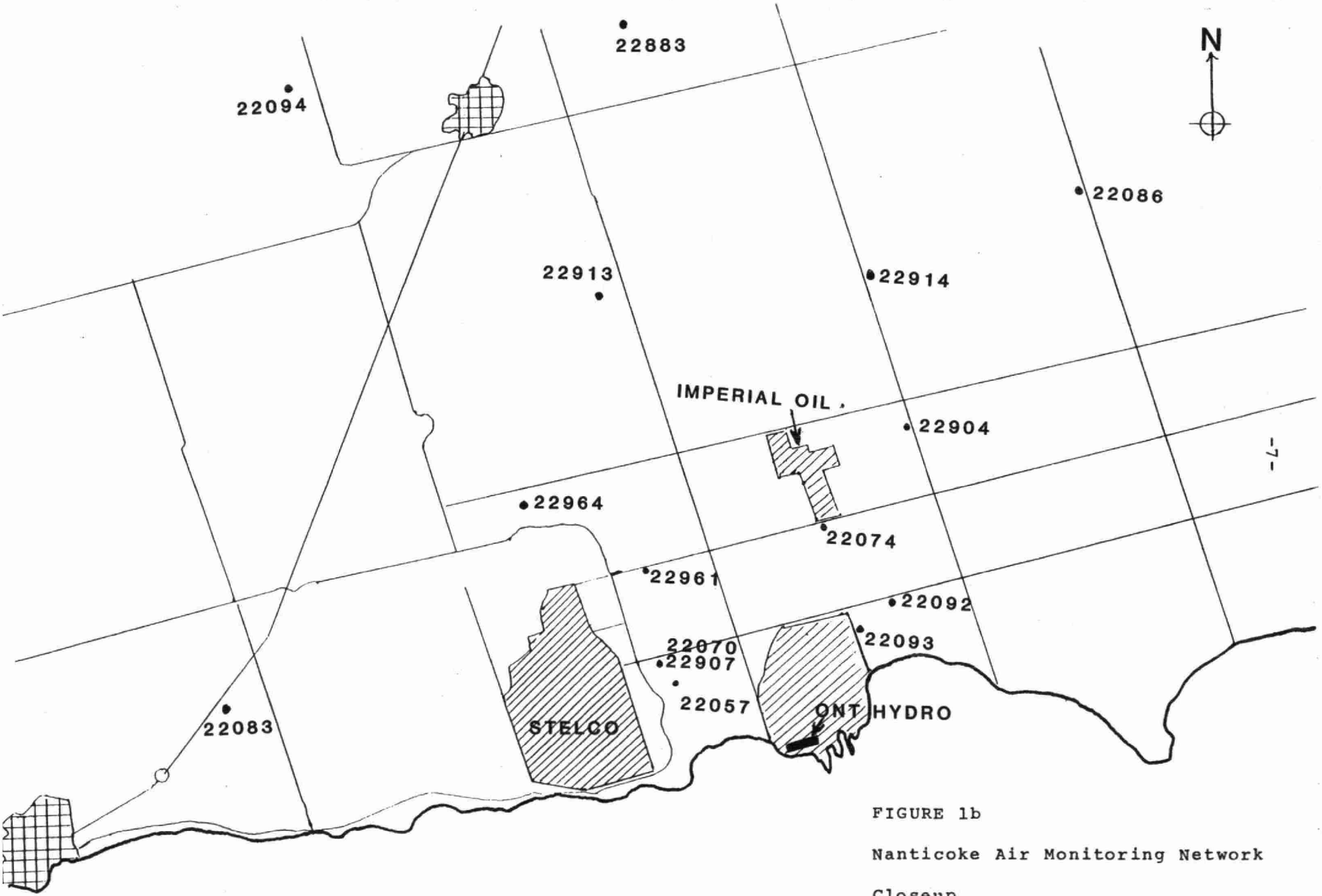


FIGURE 1b

Nanticoke Air Monitoring Network

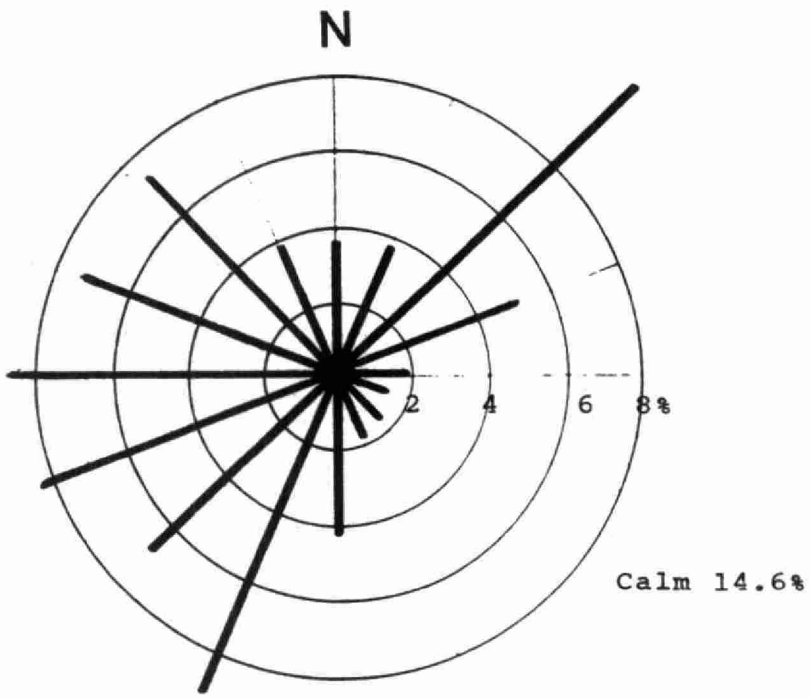
Closeup

FIGURE 2

WIND FREQUENCY DISTRIBUTION

22883 - Jarvis

1992



Lines indicate direction from which wind blew

ANALYSIS OF DATA

Sulphur Dioxide

Sulphur dioxide (SO_2) was measured continuously at five sites within the NEC network and at five Ontario Hydro stations in 1992. All of the stations easily met the annual and daily air quality objectives of .02 and .10 ppm respectively and, the hourly standard of .25 ppm was not exceeded at any station out of about 80,000 hours of monitoring. Data from the Ministry monitors are given in Table 2a and data for the Hydro monitors are in Table 2b.

Figure 3 illustrates the historical trend of sulphur dioxide annual average concentrations of six SO_2 monitors which have operated continuously since 1976. A modest decline in concentrations can be seen over this period. Similarly in Figure 4, the number of hourly exceedences per year at these six stations is shown. A declining trend is apparent in this graph as well.

TABLE 2a
SULPHUR DIOXIDE
UNITS - PARTS PER MILLION
MINISTRY OF THE ENVIRONMENT MONITORS

Ontario Objectives: 1-hour - .25
24-hour - .10
1-year - .02

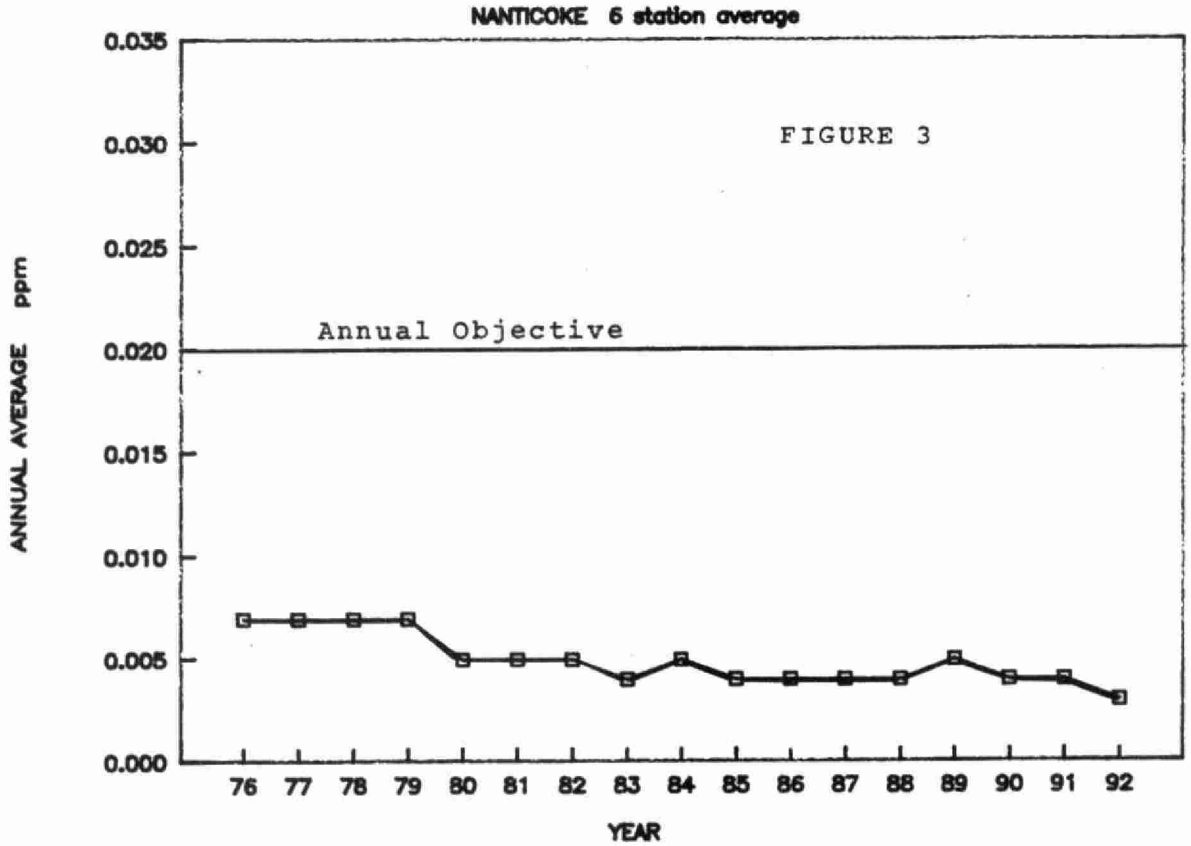
		Annual Average	Maximum 1-hour	Maximum 24-hour	# of Times > Objective 1-hour	# of Times > Objective 24-hour
22071 Simcoe	1992	.003	.06	.03	0	0
	1991	.003	.10	.02	0	0
	1990	.004	.09	.02	0	0
	1989	.005	.14	.02	0	0
22086 Cheapside	1992	.005	.14	.03	0	0
	1991	.005	.13	.03	0	0
	1990	.006	.15	.03	0	0
	1989	.007	.25	.05	0	0
22094 Townsend	1992	.003	.07	.03	0	0
	1991	.004	.13	.02	0	0
	1990	.003	.13	.02	0	0
	1989	.003	.17	.02	0	0
22901 Long Point	1992	.005	.06	.03	0	0
	1991	.004	.06	.02	0	0
	1990	.004	.10	.02	0	0
	1989	.004	.16	.03	0	0
22907 Nanticoke Village	1992	.004	.10	.04	0	0
	1991	.006	.15	.04	0	0
	1990	.008	.23	.05	0	0
	1989	.007	.16	.04	0	0

TABLE 2b
SULPHUR DIOXIDE
UNITS - PARTS PER MILLION
ONTARIO HYDRO MONITORS

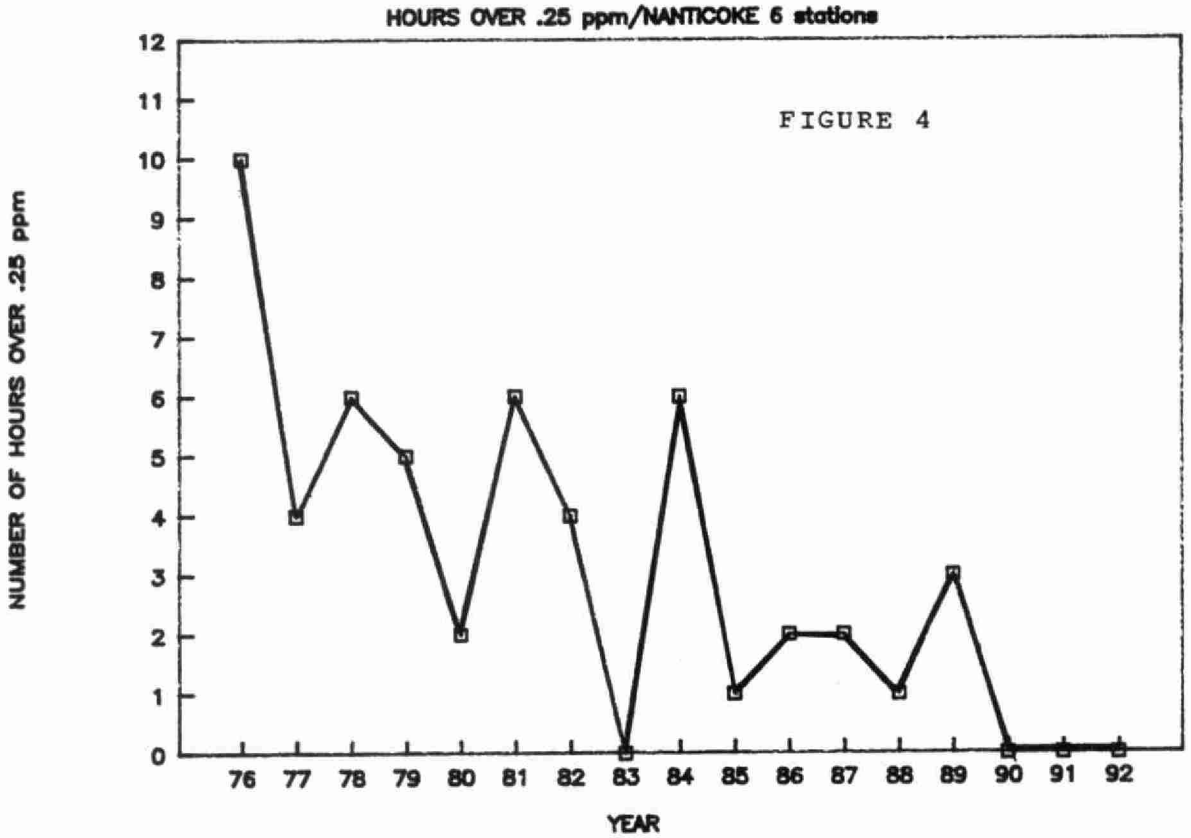
Ontario Objectives: 1-hour -.25
24-hour - .10
1-year - .02

		Annual Average	Maximum 1-hour	# of Times > Objective 1-hour	24-hour
22911 Balmoral (NNE16)	1992	.003	.09	0	0
	1991	.004	.19	0	0
	1990	.004	.14	0	0
	1989	.005	.32	1	0
22913 Nanticoke Rd. (NNW08)	1992	.002	.13	0	0
	1991	.003	.20	0	0
	1990	.003	.20	0	0
	1989	.004	.20	0	0
22914 Sandusk (NO7)	1992	.003	.21	0	0
	1991	.004	.14	0	0
	1990	.004	.09	0	0
	1989	.005	.29	2	0
22915 Kohler (NE19)	1992	.002	.07	0	0
	1991	.003	.09	0	0
	1990	.003	.12	0	0
	1989	.004	.18	0	0
22916 Walpole South School (NNE05)	1992	.004	.13	0	0
	1991	.005	.15	0	0
	1990	.005	.23	0	0
	1989	.006	.20	0	0

SULPHUR DIOXIDE TREND



SULPHUR DIOXIDE EXCEEDANCE TREND



Total Reduced Sulphur

Total Reduced Sulphur (TRS) was monitored at two locations - in Nanticoke Village and at South Walpole School on Sandusk Road. There are no general criteria for TRS but there is an hourly objective for hydrogen sulphide (H_2S), the "rotten egg" gas, of 20 ppb. The monitoring instrument measures H_2S, and other sulphur compounds.

Sources of these pollutants include slag quenching activities and the coke ovens/by-products plant at Stelco and fuel oil storage tanks and a sulphur recovery operation at Esso. Apart from industrial sources, sulphur compounds can be liberated from groundwaters that have been contaminated by natural seepages or from leaking natural gas wells, known to exist in the area. Stelco sulphide emissions have been shown to consist primarily of H_2S and thus, comparison of TRS data to the H_2S objective, particularly within Nanticoke Village when downwind of Stelco, is reasonable. Imperial Oil emissions have been less well characterized but are not believed to consist primarily of H_2S. Other organic sulphur compounds are probably present in their emissions and consequently levels downwind of this refinery cannot always be compared to the H_2S standard. The TRS data are summarized in Table 3.

In 1992, TRS levels remained low at the South Walpole School station. Nanticoke Village showed higher levels than the school. Yearly trends are illustrated in Figure 5. These data indicate the number of hours exceeding 10 ppb which is the approximate odour threshold for H_2S and a level the Ministry is aiming to reset the criterion at.

The South Walpole School station did not exceed the criterion level of 20 ppb but did record 3 hours above the odour threshold of 10 ppb in 1992, as given in Table 3, fewer than the two previous years. In the past, most of these concentrations coincided with equally high or higher levels measured at the Nanticoke Village Station, implying that Stelco, not Imperial Oil, may have been the source of these elevated levels measured at the school. However this was not true in 1992. The refinery may have been the source of the three elevated readings at the school.

Levels recorded in Nanticoke Village close to Stelco were much improved from 1991. There were no hours above the hourly H_2S objective (20 ppb) during the year and 22 hours above the odour threshold level of 10 ppb, down from 90 in 1991.

Figure 6 illustrates TRS pollution roses for the two stations. The roses indicate a clear effect of the steel mill and a smaller one from the refinery.

In 1992 Stelco instituted changes to their slag quenching practices to help alleviate the odour problems measured downwind the previous few years. This involved substantially longer air cooling of slag preceding a few hours of only intermittent water cooling. This program commenced in May 1992 and had a dramatic effect on lowering TRS measured in the Village. Figure 7 shows a month by month trend of 10 ppb exceedances. Following May 1992, only 2 hours marginally exceeded this level. Figure 8 shows a similar trend, but for 20 ppb exceedences (of the H_2S standard). There have been no such exceedances since 1990.

Thus the blast furnace slag quench abatement program has been very successful.

Other odour sources at Stelco, namely the coke oven plant are also being addressed. A new gas collection system for the tar decanters and dehydrators is being installed and tested in 1993.

TABLE 3
TOTAL REDUCED SULPHUR
UNITS - PARTS PER BILLION

Ontario Objectives: 1-hour - 20
(Hydrogen sulphide)

		Annual Average	Maximum 1-hour	# of Hours Above 20 ppb	10 ppb
22904 South Walpole School	1992	.5	17	0	3
	1991	.8	20	0	15
	1990	.7	20	0	11
	1989	.7	12	0	2
22907 Nanticoke Village	1992	1.0	20	0	22
	1991	1.1	30	6	90
	1990	1.4	82	20	172
	1989	1.2	141	12	102

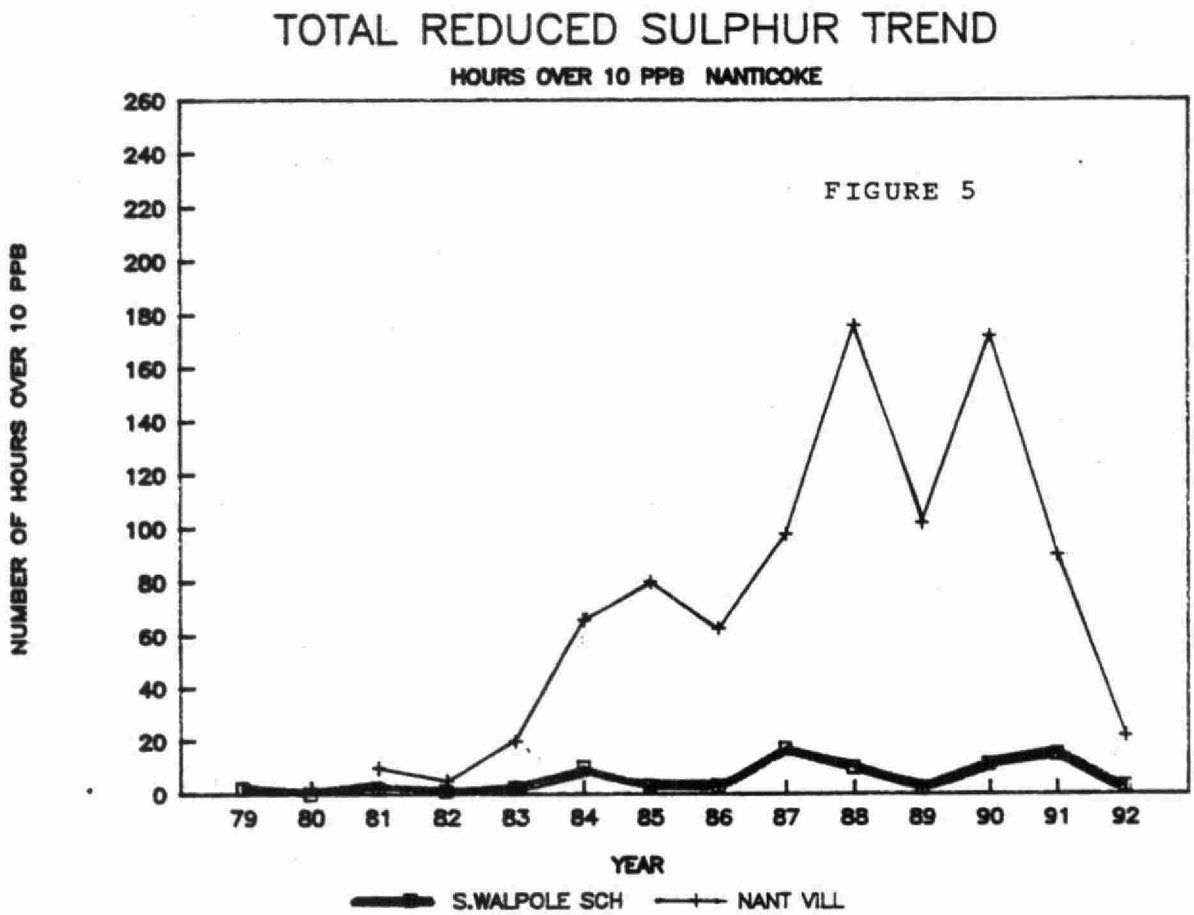

TOTAL REDUCED SULPHUR TREND
HOURS OVER 10 PPB NANTICOKE
NUMBER OF HOURS OVER 10 PPB
260
240
220
200
180
160
140
120
100
80
60
40
20
0
79
80
81
82
83
84
85
86
87
88
89
90
91
92
YEAR
S.WALPOLE SCH
NANT VILL

FIGURE 5

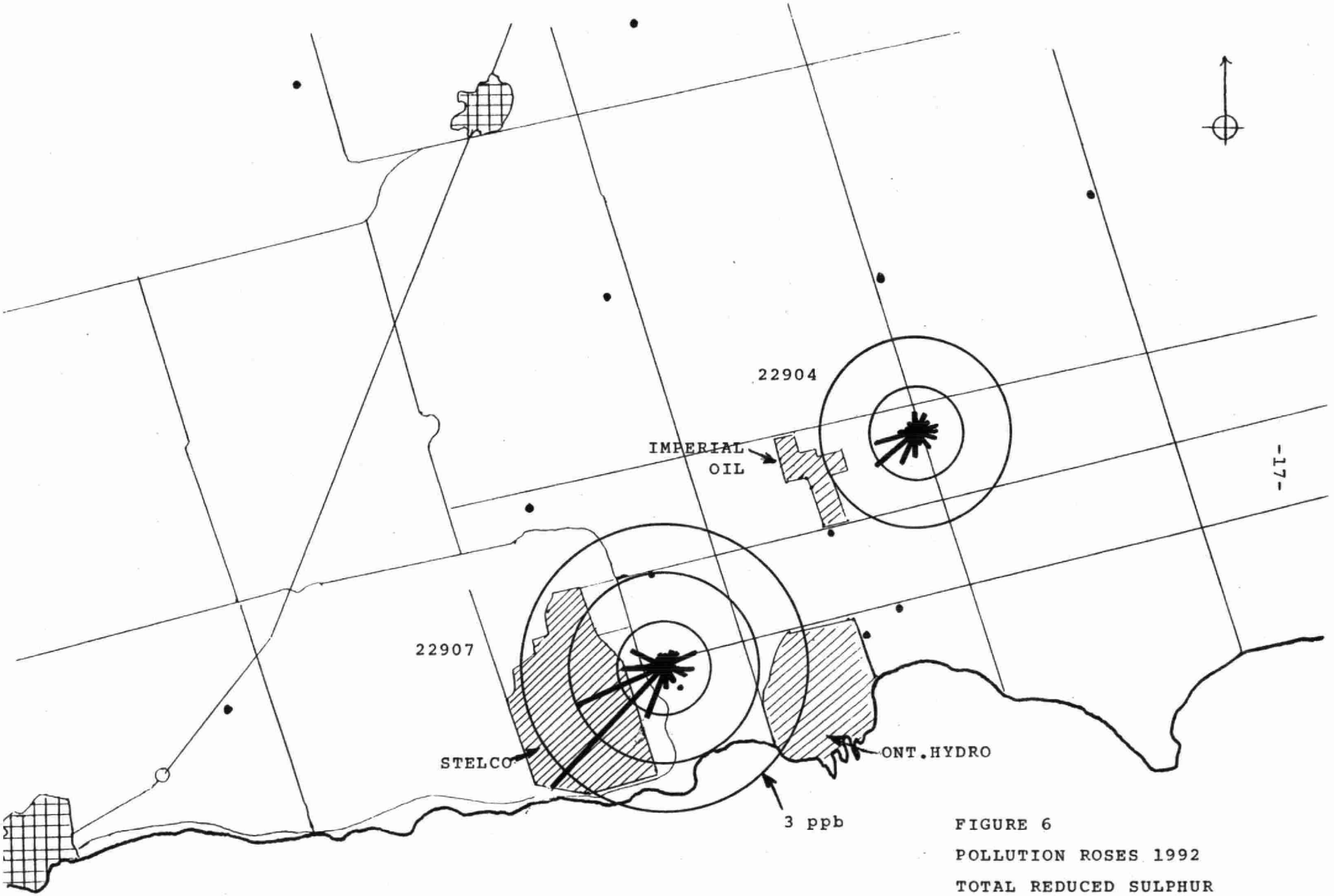
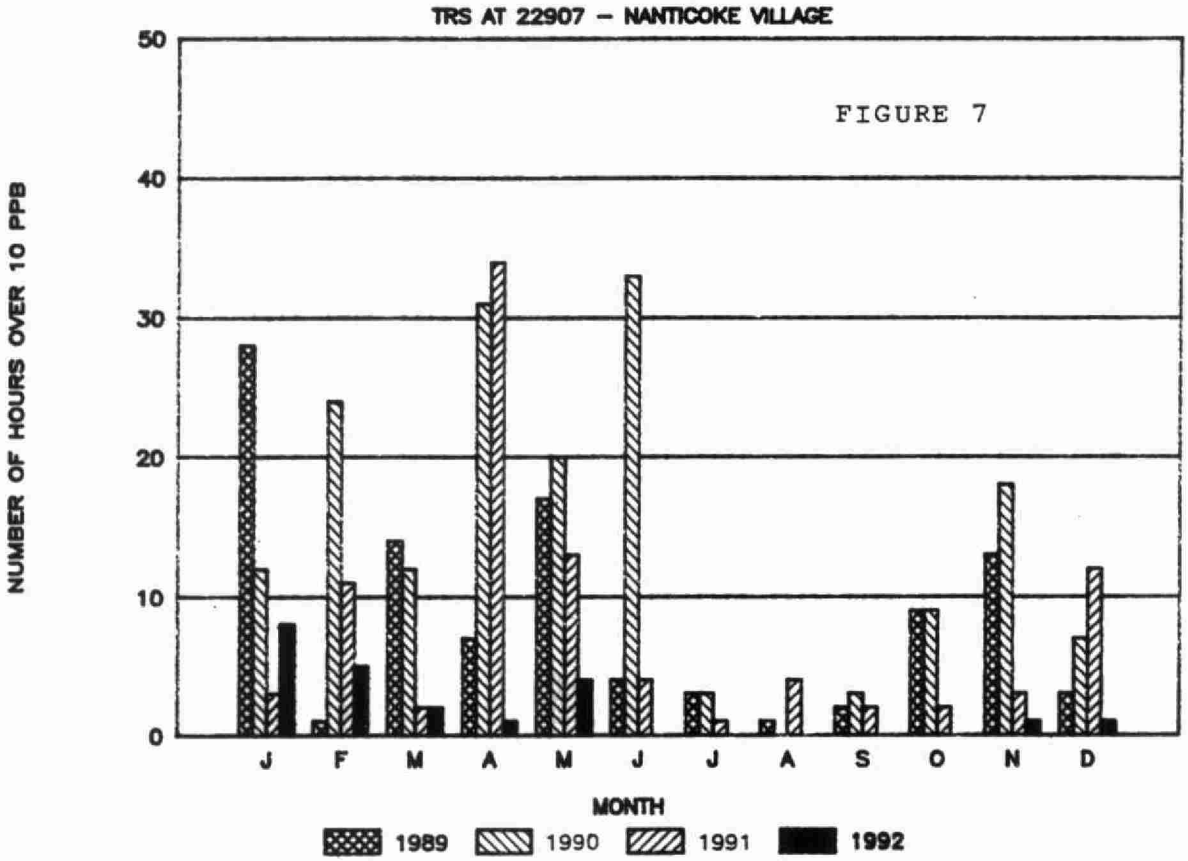
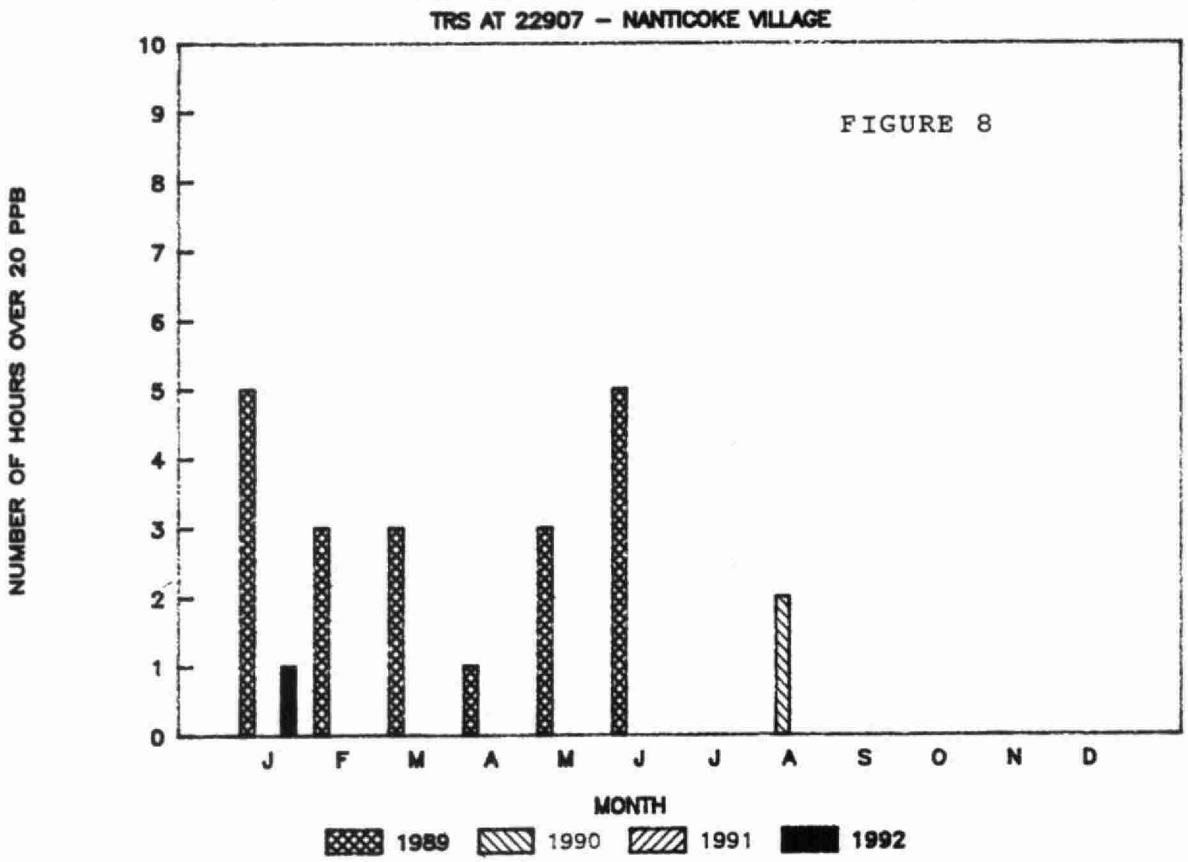


FIGURE 6
POLLUTION ROSES 1992
TOTAL REDUCED SULPHUR

HOURLY FREQUENCIES OVER ODOUR THRESHOLD



HOURLY FREQUENCIES OVER H2S STANDARD



Oxides of Nitrogen

Oxides of nitrogen result from high temperature combustion sources including automobiles and industrial facilities. The most abundant oxides are nitric oxide (NO) which is largely a direct emission of fuel burning and nitrogen dioxide (NO_2) which is mostly an oxidation product once the contaminant is airborne. Objectives exist only for nitrogen dioxide and are based on odour threshold levels (hourly - .2 ppm) and health effects (24-hour - .1 ppm). Other adverse effects occurring at higher levels include vegetation damage, reduced visibility and corrosion of metals.

Data for NO_2 and NO for three stations are summarized in Tables 4 and 5. Levels in 1992 continued to be very low and well within objectives. There have never been any NO_2 exceedences measured. The concentrations at the three stations are similar to each other and thus tend to represent background levels.

A combined yearly trend of NO_2 for the three stations is given in Figure 9. Overall, a small trend to decreasing concentrations is apparent.

Table 5 gives NO averages in 1992. Figure 10 depicts annual NO trends for the three stations and displays stable levels exhibiting no real trend.

TABLE 4
NITROGEN DIOXIDE
UNITS - PARTS PER MILLION

Ontario Objectives: 1-hour - .20
24-hour - .10

		Annual Average	Maximum 1-hour	Maximum 24-hour	# of Times > Objective 1-hour	# of Times > Objective 24-hour
22071 Simcoe	1992	.010	.05	.03	0	0
	1991	.007	.04	.03	0	0
	1990	.005	.05	.02	0	0
	1989	.010	.06	.03	0	0
22086 Cheapside	1992	.013	.05	.03	0	0
	1991	.005	.05	.02	0	0
	1990	.009	.04	.02	0	0
	1989	.010	.05	.03	0	0
22901 Long Point	1992	.006	.05	.03	0	0
	1991	.006	.08	.02	0	0
	1990	.008	.06	.03	0	0
	1989	.007	.05	.03	0	0

TABLE 5
NITRIC OXIDE
UNITS - PARTS PER MILLION

No MOE Objective

		Annual Average	Maximum 1-hour	Maximum 24-hour
22071 Simcoe	1992	.002	.07	.02
	1991	.002	.08	.02
	1990	.001	.09	.01
	1989	.001	.09	.02
22086 Cheapside	1992	.004	.09	.02
	1991	.005	.11	.03
	1990	.001	.11	.02
	1989	.002	.13	.03
22901 Long Point	1992	.001	.10	.02
	1991	.006	.06	.02
	1990	.001	.04	.01
	1989	.001	.07	.05

NITROGEN DIOXIDE TREND

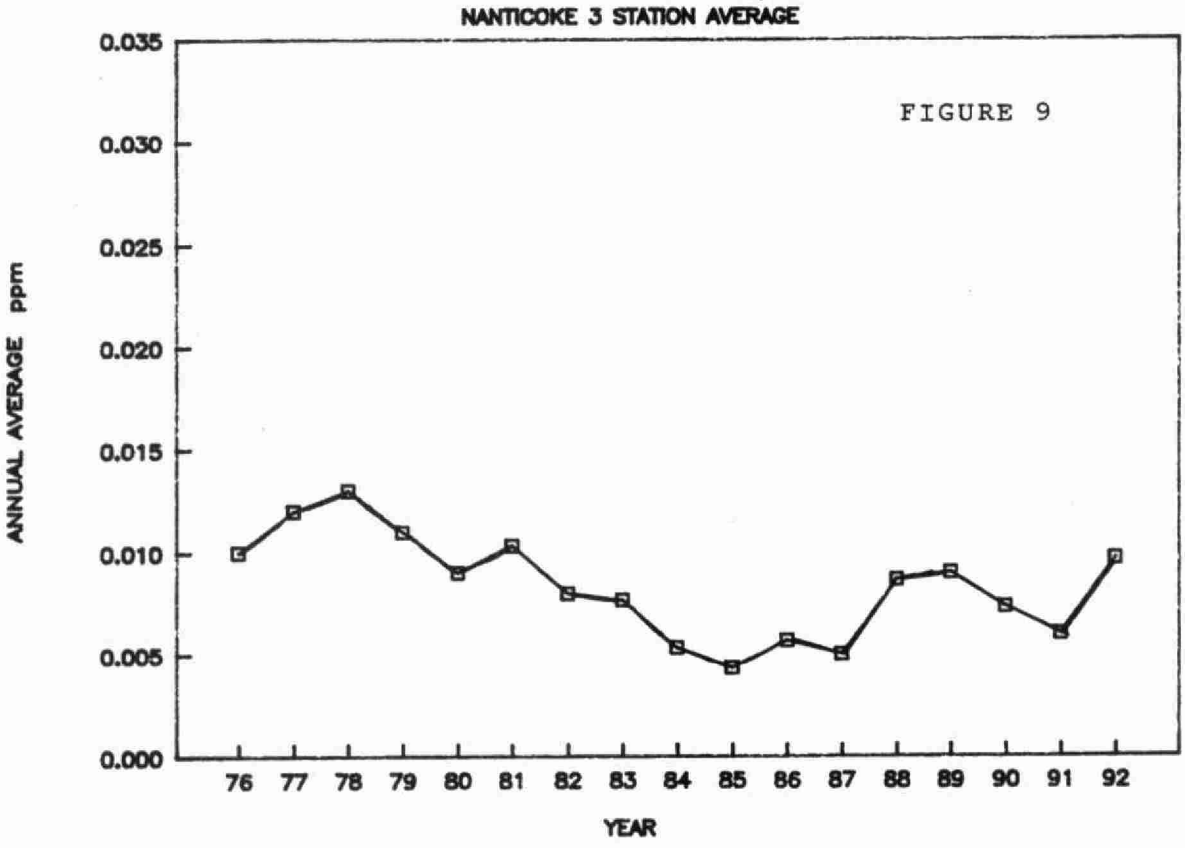


FIGURE 9

NITRIC OXIDE TREND

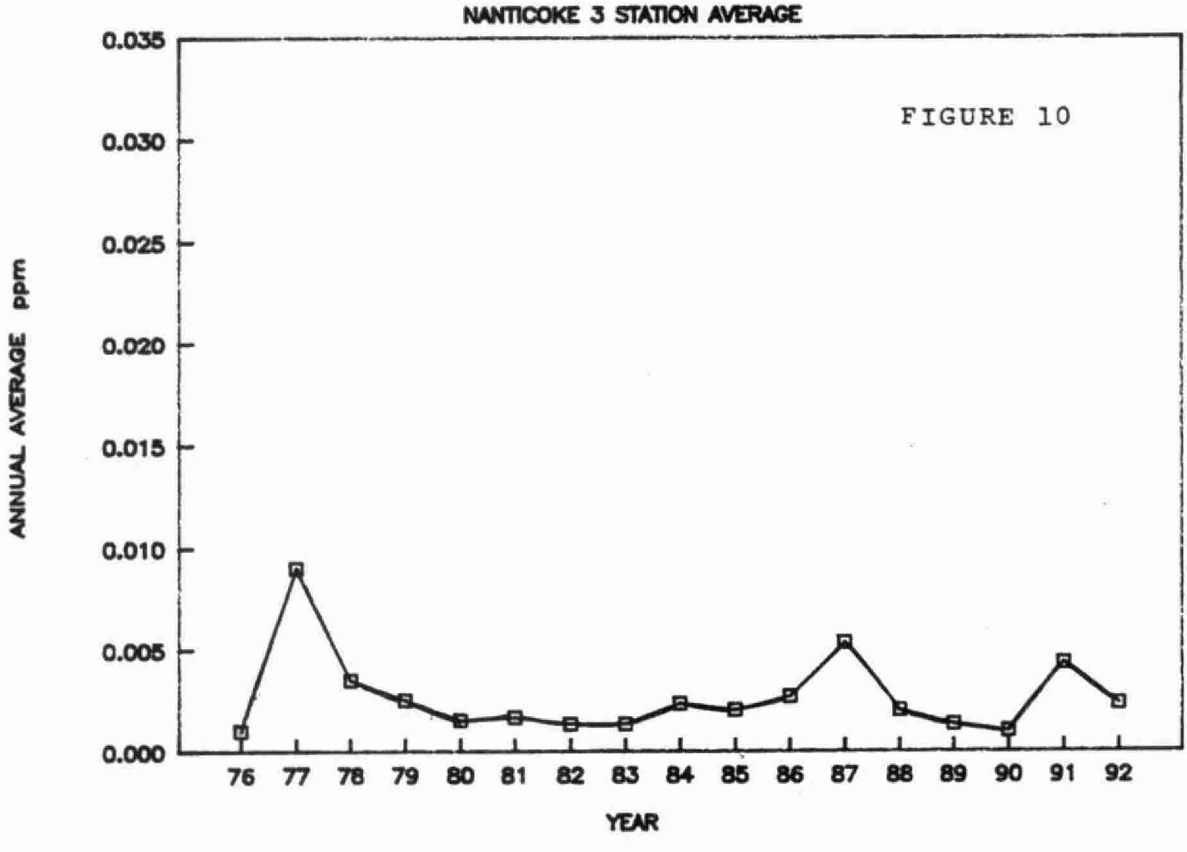


FIGURE 10

Soiling Index (Coefficient of Haze)

Coefficient of haze tape samplers operate continuously and determine hourly soiling values of dust in air. Air is drawn through a filter paper trapping dust on the filter, and the optical density of the darkened spot is measured by light transmittance. The instrument takes readings before and after sample collection. The resultant light obstruction is determined and converted to a unit known as coefficient of haze. The particles sampled are very small, less that 10 microns in diameter (a micron is a millionth of a metre) and thus represent the respirable range.

One tape sampler operates at 22907 - Nanticoke Village and the 1992 data are summarized in Table 6. The yearly average was less than half the yearly objective and the daily objective was not exceeded. Concentrations over four years of sampling have been stable as shown by Figure 11.

TABLE 6
SOILING INDEX
UNITS - COH'S/1000 FT.

Ontario Objectives: 24-hour - 1.0
1-year - 0.5

		Annual Average	Maximum 24-hour	# of times > 24-hour Objective
22907 Nanticoke Village	1992	.23	0.7	0
	1991	.24	0.7	0
	1990	.22	0.8	0
	1989	.25	0.8	0

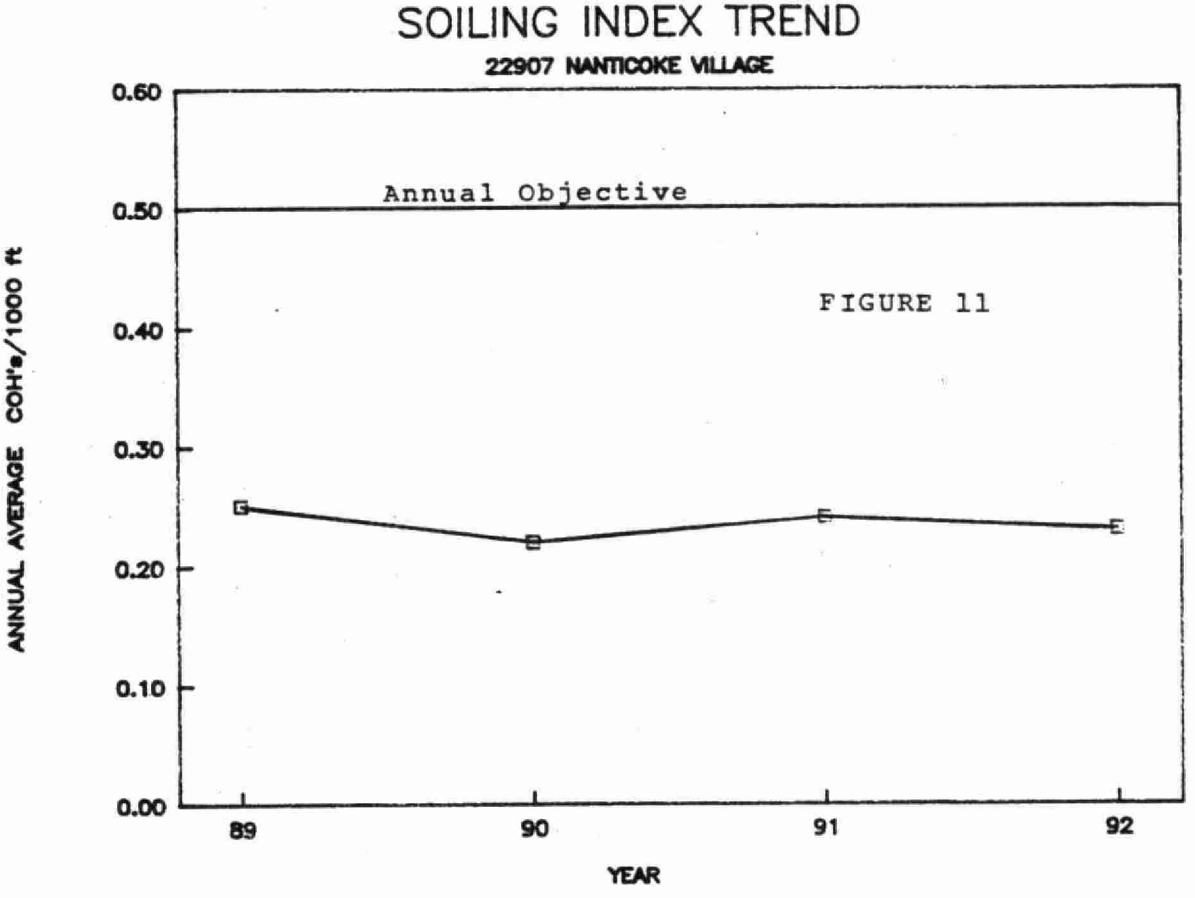

SOILING INDEX TREND
22907 NANTICOKE VILLAGE
Annual Objective
ANNUAL AVERAGE COH's/1000 ft
0.60
0.50
0.40
0.30
0.20
0.10
0.00
89
90
91
92
YEAR

FIGURE 11

Ozone

Oxidants are products of photochemical reactions involving oxides of nitrogen, hydrocarbons and sunlight. The nitrogen oxides and hydrocarbons come mainly from cars and industry. Ozone (O_3) is the main oxidant chemical produced. Ozone damages vegetation including tobacco and tomato crops. The 1-hour objective for ozone (.08 ppm) is based on vegetation effects, but ozone is also a respiratory irritant and can have adverse human health effects at more concentrated levels.

Concern is often expressed about loss of ozone in the stratosphere. Although unwanted at ground level, ozone plays an important role in the upper atmosphere, where it absorbs ultraviolet light from the sun. Loss of this upper level ozone is indeed an ongoing concern but is not the focus of this report.

Ground level ozone concentrations follow very definite annual and daily trends. Highest levels occur during the summer (May to September), and the daily maxima usually occur during mid-afternoon. Both patterns occur because ozone production increases with temperature and sunlight.

Ozone concentrations were measured at two sites and data are summarized in Table 7. In 1992, ozone levels again frequently exceeded the hourly objective in the summer as in previous years. There were 179 exceedances of the objective observed at Long Point and 25 at Simcoe. Elevated levels generally occurred at the same time at both stations during the summer with slightly higher concentrations measured at Long Point during southerly winds indicating that the high concentrations were imported from the United States.

The yearly trend graph of hourly exceedences at the two stations in Figure 12 indicates random fluctuations which are probably related to climatological variation. The year 1988 was particularly bad for ozone, due to the hot dry summer.

Ozone, hydrocarbons and oxides of nitrogen can be transported over great distances and can be augmented by local sources. It is generally believed that the ozone problem in Southern Ontario has a large component due to long range transport from the United States and thus will have to be resolved on an international and national rather than local scale.

In recognition of the seriousness of the ground-level ozone problem, the Canadian Council of Ministers of the Environment decided in 1988 to develop a management plan for he control of nitrogen oxides (NOx) and volatile organic compounds (VOC). A three phase NOx and VOC control plan was developed to resolve the ozone problem by the year 2005. This program is being undertaken in concert with the United States which plans similar strategies.

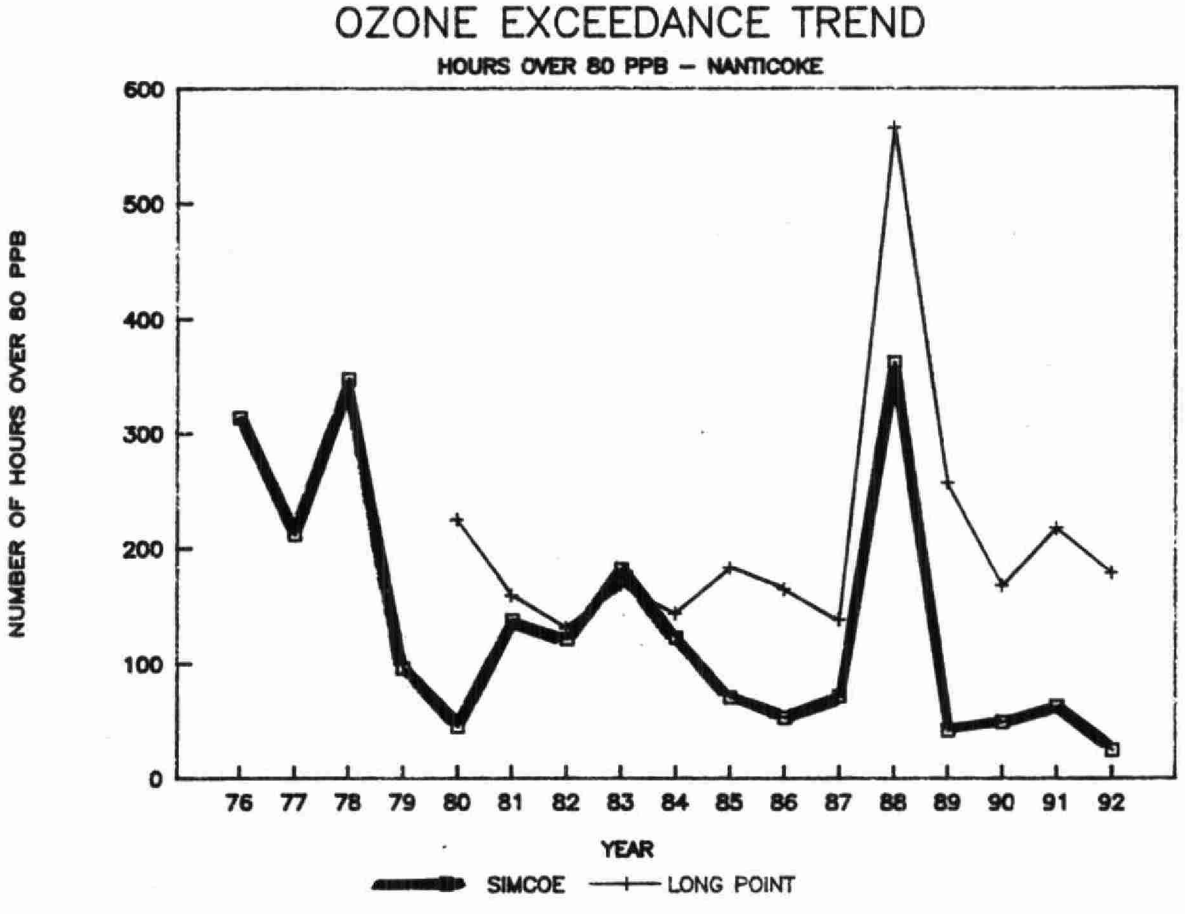
Ontario Hydro is already taking voluntary control steps by installing low - NO_x burners at its coal burning power plants, including Nanticoke.

TABLE 7
OZONE
UNITS - PARTS PER MILLION

Ontario Objectives: 1-hour - .08

		Annual Average	Maximum 1-hour	# of Hours Above Objective
22071 Simcoe	1992	.026	.106	25
	1991	.029	.104	63
	1990	.026	.111	49
	1989	.029	.093	42
22901 Long Point	1992	.032	.133	179
	1991	.034	.128	218
	1990	.033	.130	168
	1989	.036	.135	257

FIGURE 12


OZONE EXCEEDANCE TREND
HOURS OVER 80 PPB – NANTICOKE
NUMBER OF HOURS OVER 80 PPB
600
500
400
300
200
100
0
76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92
YEAR
SIMCOE
LONG POINT

Total Suspended Particulates

Total suspended particulates (TSP) in air are measured with high volume samplers which draw a known volume of air through a pre-weighed filter for a 24 hour period (midnight to midnight). The exposed filter is weighed, and the difference (weight of solids on filter) in conjunction with the known air volume sampled is used to calculate a TSP concentration in micrograms per cubic meter. The objective for a 24 hour average is 120 ug/m^3 while the yearly geometric mean objective is 60 ug/m^3. The samplers operate once every six days.

Data from total suspended particulate measurements at six locations are summarized in Table 8. The daily objective of 120 ug/m^3 was exceeded at two locations, both near Stelco. The yearly objective of 60 ug/m^3 was met at all stations.

The station in Nanticoke Village (22907) measured one exceedence, likely due to fugitive emissions from Stelco property. The station known as Stelco North (22964) also measured one elevated reading on the same day as the Nanticoke Village exceedance.

Following black dust complaints, filters at 22907 (near Stelco) and 22092 (near Ontario Hydro) were analyzed for carbon. Data are summarized, in Table 8. The levels were slightly higher at 22907 but both station's concentrations were not particularly high - there are no standards for these measurements. The readings did tend to increase when the winds were blowing from the plants.

A total of five hi - vol stations have been operating continuously since 1984 in the Nanticoke area, and the combined yearly trend of these stations is shown in Figure 13. Low, stable levels are evident. Figure 14 shows the trend of suspended particulate at station 22092 near Ontario Hydro. An abatement program at their ash lagoon area introduced several years ago and maintained to the present has resulted in acceptable particulate levels near this facility, well below objectives.

Figure 15 shows the trend of suspended particulate at station 22907 in Nanticoke Village near Stelco. Concentrations can been seen to be gradually improving.

Levels within Nanticoke Village, close to Stelco operations and to a lesser degree, near Ontario Hydro, remain a local concern and trends will be carefully monitored to ensure that particulate levels remain at acceptable levels.

TABLE 8
SUSPENDED PARTICULATES
UNITS - MICROGRAMS PER CUBIC METER

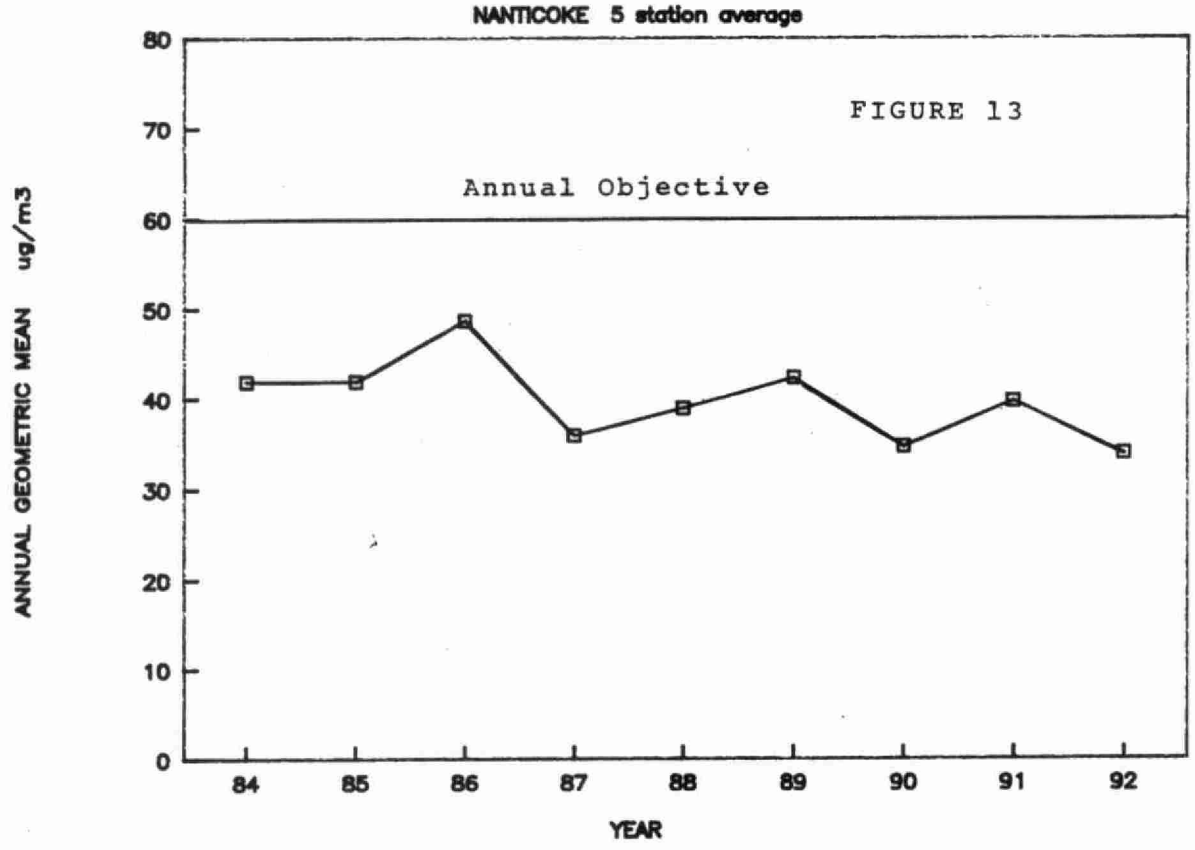
Ontario Objectives: 24-hour - 120
1-year geometric mean - 60

		Geometric Mean			Maximum	% of Samples
		1990	1991	1992	1992	> 120 (1992)
22092	Rainham/Sandusk	34	41	30	110	0
22904	South Walpole School	27	32	26	82	0
22907	Nanticoke Village	47	52	43	137	2
22961	Nanticoke North	35	40	33	104	0
22964	Stelco North	30	32	27	121	2

CARBON CONTENT IN SUSPENDED PARTICULATE

		Total Carbon		Elemental Carbon	
		Geo. Mean	Maximum	Geo. Mean	Maximum
22092-Rainham/Sandusk	1992	3.7	14.6	1.0	6.3
22907-Nanticoke Village	1992	4.9	17.0	1.4	7.5

SUSPENDED PARTICULATE TREND



PARTICULATE TREND – ONTARIO HYDRO

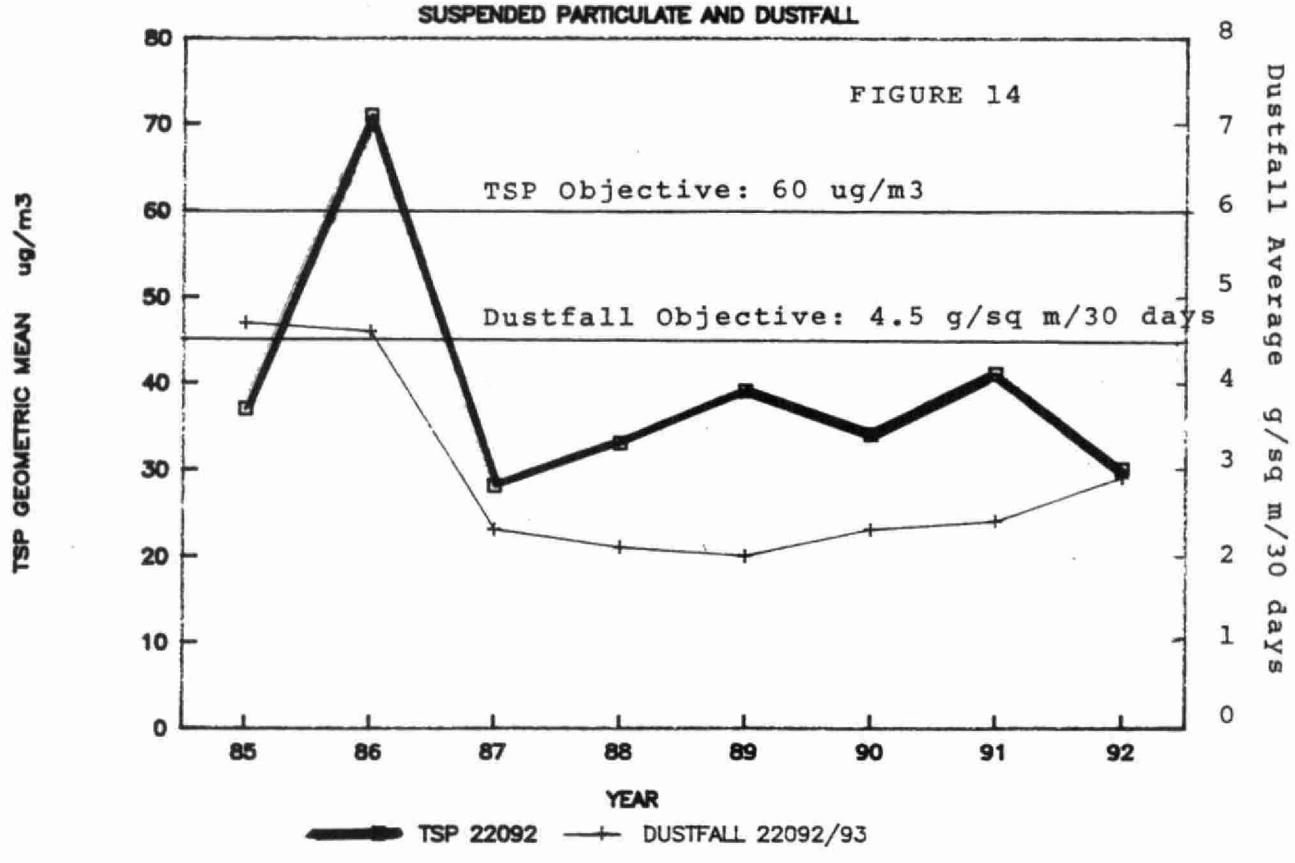
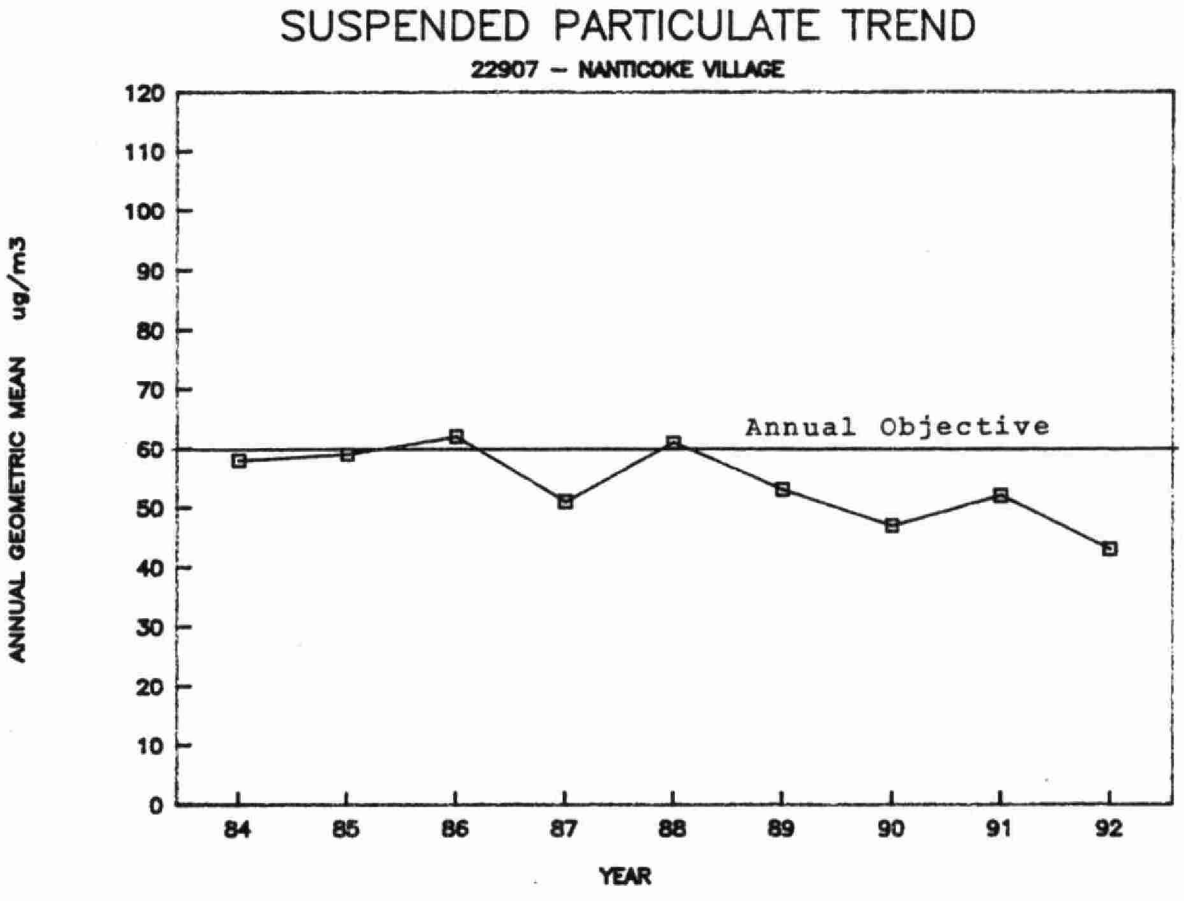


FIGURE 15


SUSPENDED PARTICULATE TREND
22907 – NANTICOKE VILLAGE
ANNUAL GEOMETRIC MEAN ug/m3
120
110
100
90
80
70
60
50
40
30
20
10
0
Annual Objective
84
85
86
87
88
89
90
91
92
YEAR

Dustfall

Dustfall is that material which settles out of the atmosphere by gravity. It is collected in plastic containers during a 30 day exposure time. The collected material is weighed and expressed as a deposition rate of grams/m^2/30 days. The measurement is imprecise and effects are restricted to relatively local areas, however, it is the best method for measuring this heavy material. Dustfall objectives are based on nuisance effects and are 7.0 grams/m^2/30 days (monthly) and 4.5 grams/m^2/30 days (yearly average). Since dustfall is comprised solely of non-inhalable large particles it is not a health related parameter.

Dustfall was measured within Nanticoke Village in 1992, (station 22070) and data are given in Table 9. As in previous years, concentrations were low and below the monthly objective in all samples.

The annual trend at this station since 1975 is given in Figure 16. An increase occurred in 1984, and concentrations have since held relatively steady, below the yearly objective.

Two dustfall jars were located near the Ontario Hydro flyash lagoon area. The monthly objective was not exceeded at either 22092 or 22093 which lies closest to the ash lagoon area. In fact, the objective has not been exceeded at either station since January 1987.

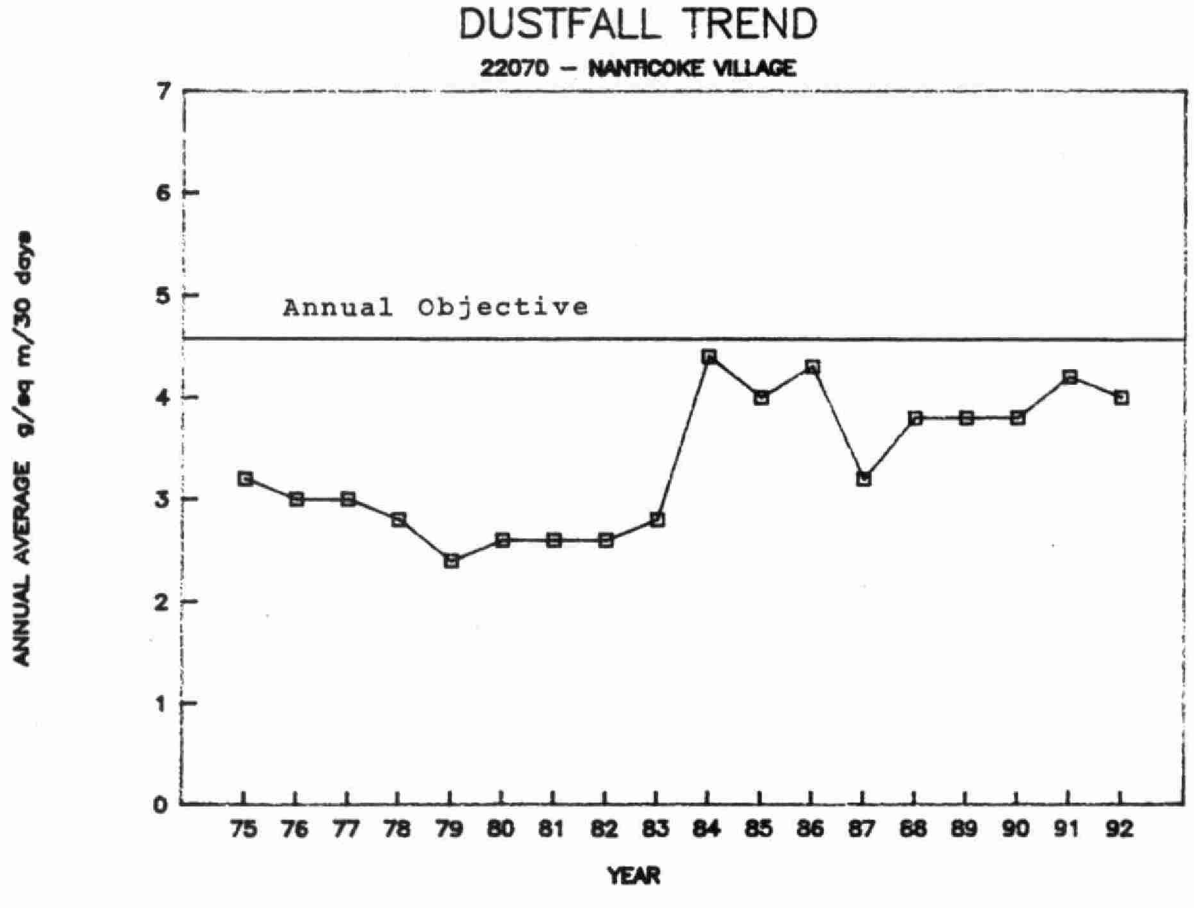
The control program at Ontario Hydro referred to earlier has been successful in reducing windblown flyash emissions, previously shown by the trend graph in Figure 14.

TABLE 9
DUSTFALL
UNITS - GRAMS/ SQUARE METRE/30 DAYS

Ontario Objectives: 1-month - 7.0
1-year Average - 4.5

		Annual Average			Maximum 1992 1 Month	# of Months Above Objective		
		1990	1991	1992		1990	1991	1992
22070	Nanticoke Village	3.8	4.2	4.0	4.9	1	0	0
22092	Rainham/Sandusk	1.8	1.7	2.5	4.8	0	0	0
22093	N.G.S. Flyash Area	2.7	3.1	3.2	6.7	0	0	0

FIGURE 16


DUSTFALL TREND
22070 – NANTICOKE VILLAGE
ANNUAL AVERAGE g/sq m/30 days
Annual Objective
0
1
2
3
4
5
6
7
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92
YEAR

Fluoridation

This measurement is a relatively simple assessment used to determine quantities of fluoride compounds in the ambient air. A lime coated paper is exposed to the atmosphere for approximately 30 days and chemically analyzed for fluoride. The fluoride objectives are based on vegetation damage and for this reason, the objective is more stringent during the growing season. For the period of April 1 to October 31, it is 40 micrograms/100 cm^2/30 days while for the remainder of the year it is 80. A possible source of this contaminant is Stelco's basic oxygen furnace, although gas scrubbing removes most of the emissions.

Four stations surrounding Stelco property monitored fluoride and 1992 data are given in Table 10 together with a trend graph in Figure 17.

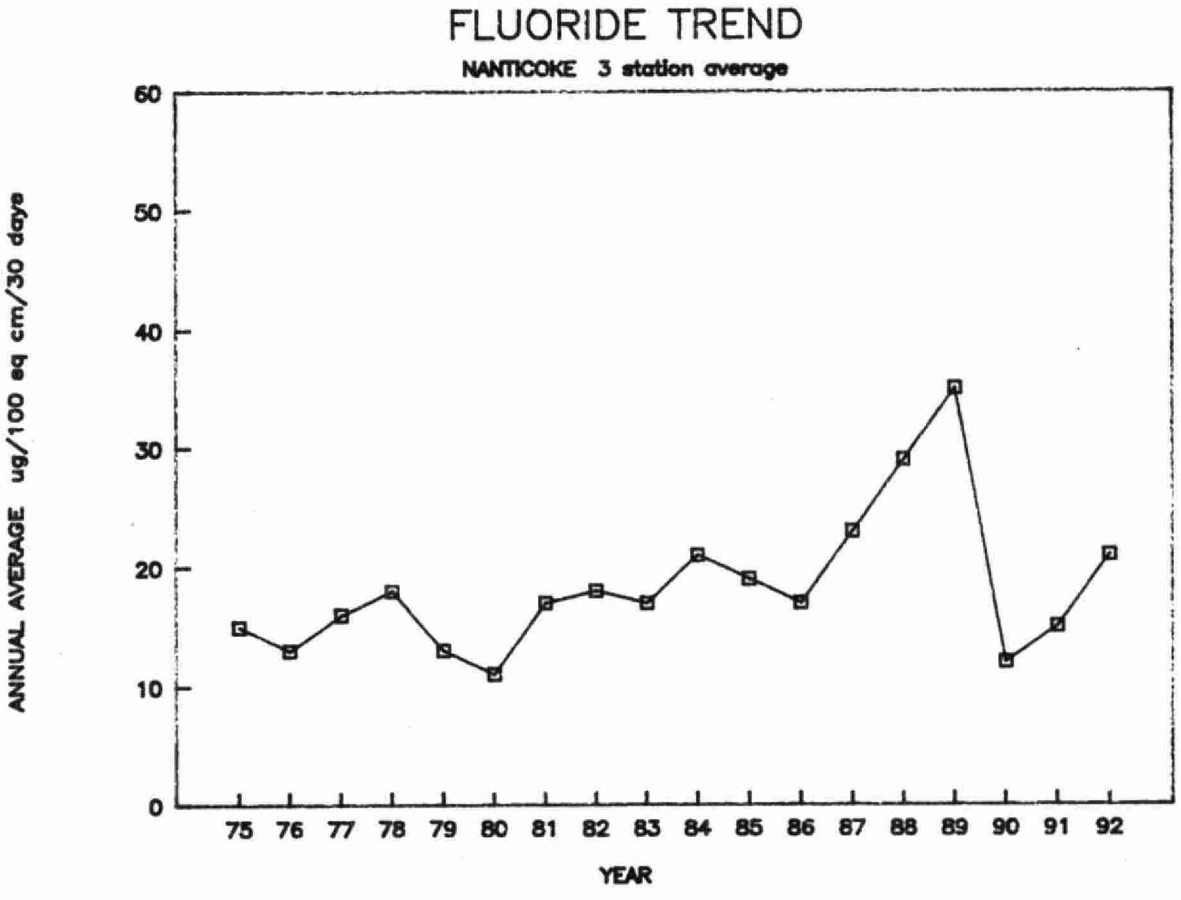
Two stations showed exceedances of objectives. There were two observed at 22057 - Nanticoke Creek and four at 22961 - Nanticoke North which tend to be downwind of Stelco the most, of the four stations. The exceedances are not considered serious, and the trend graph in Figure 17 indicates some variability from year to year with no clear trend evident.

TABLE 10
FLUORIDATION RATE
UNITS - MICROGRAMS/ 100 CM^2/30 DAYS

Ontario Objectives: April 1 to October 31 - 40
November 1 to March 31 - 80

		Annual Average			Maximum 1992 1 Month	# of Months Above Objective		
		1990	1991	1992		1990	1991	1992
22057	Nanticoke Creek	14	16	25	51	1	0	2
22074	Imperial Oil	12	17	23	44	0	0	0
22083	Dogs Nest	11	13	18	32	0	0	0
22961	Nanticoke North	22	30	41	105	0	1	4

FIGURE 17


FLUORIDE TREND
NANTICOKE 3 station average
ANNUAL AVERAGE ug/100 sq cm/30 days
60
50
40
30
20
10
0
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92
YEAR

DISCUSSION

Overall, 1992 data in the Nanticoke area revealed that air quality was very good and reflected a relatively minor impact by the main industries. Sulphurous odours near Stelco were the main item of concern but control programs instituted by the company in 1992 have had dramatic impacts in lowering emissions.

Pollutants such as sulphur dioxide, oxides of nitrogen, and particulates showed quite low levels well within relevant objectives.

Sulphur dioxide (SO_2) normally recorded low measurements throughout the network of monitors. The Nanticoke Generating Station is the largest SO_2 source in the area but its effect on the Nanticoke area was fairly minor. Out of approximately 80,000 hours of monitoring, none exceeded the hourly objective.

Particulate levels in the region were quite low and generally showed acceptable concentrations. Fugitive dust emissions from the Stelco site were still occasionally a problem, while close to Ontario Hydro property, distinct improvements in both suspended particulates and dustfall readings have been measured and maintained for several years. A control program to control windblown flyash has been successful.

Fluoride levels around Stelco showed a few exceedances of the monthly objectives, but there is no trend to increasing concentrations.

Another pollutant of major concern is ozone, a product of long range transport. Ozone again routinely exceeded objectives during the summer in Southern Ontario and appeared to arrive mostly from the United States. Levels measured at Long Point were among the highest recorded in the Province. Oxidant control will be required on an international and national rather than local scale. To this end, control programs in both the U.S. and Canada are being implemented to control volatile organic compounds (VOC) and nitrogen oxides (NOx) in order to resolve the ground level ozone problem by the year 2005. The Nanticoke based industries will be required to participate in programs as they are developed. In fact, the industries have already begun some programs, e.g. NO_x control at Hydro and VOC control at Imperial Oil.

Long term programs in both Canada and the United States are being implemented to overcome the ground level ozone problem, but as an interim measure there is a joint Federal/Provincial initiative to forecast high ozone days in the summer in routine weather reports. The public will be advised that sensitive individuals may experience respiratory symptoms and should alter their activities accordingly. The public will be encouraged to reduce their use of automobiles, to car pool, to use public transit and to avoid the use of paints and solvents and gasoline powered equipment such as lawn mowers.